PROCEEDINGS

OF THE

ROYAL SOCIETY OF EDINBURGH.

VOL. V. 1865–66. No. 68.

EIGHTY-THIRD SESSION.

Monday, 27th November 1865.

PROFESSOR KELLAND, V.P., in the Chair.

The following Council were elected:—

President.

PRINCIPAL SIR DAVID BREWSTER, K.H., LL.D., D.C.L.

Honorary Vice-President, having filled the Office of President.

HIS GRACE THE DUKE OF ARGYLL.

Vice-Presidents.

Professor KELLAND.
Hon. LORD NEAVES.
Principal FORBES.
Professor INNES.
Prof. LYON PLAYFAIR, C.B.
D. MILNE HOME.

General Secretary—DR JOHN HUTTON BALFOUR.

Secretaries to the Ordinary Meetings.

DR GEORGE JAMES ALLMAN.
Professor P. GUTHRIE TAIT.

Treasurer—DAVID SMITH, Esq.

Curator of Library and Museum—DR DOUGLAS MACLAGAN.

Councillors.

A. KEITH JOHNSTON, Esq.
Rev. DR STEVENSON.
DR STEVENSON MACADAM.
Hon. LORD JERVISWOODE.
JAMES T. GIBSON-CRAIG, Esq.
EDWARD SANG, Esq.
SIR JAMES COXE, M.D.
Rev. DR BLAIKIE.
DR CHRISTISON.
DR A. CRUM BROWN.
DR BURT.
Professor MACDOUGALL.

Monday, 4th December 1865.

The President, Sir David Brewster, at the request of the Council, delivered the following Opening Address:—

Among the various functions which our scientific institutions are expected to discharge, not the least important is to foster the labours and protect the interests of discoverers and inventors,—of those who create new forms of matter and new processes of art,—who invent new instruments, and new machinery for controlling and rendering useful the forces of the material world.

The rights of property, in its material phase, whatever be its character, and by whatever means it has been acquired, have ever been held sacred, even in barbarous communities. The hoarded treasure, or the portion of the earth's crust which it may purchase, can be wrested from its owner but by the forfeiture of crime, or the grasp of conquest. As civilisation advances, new wants are developed, and new rights established. The historian, the philosopher, the antiquary, and the poet—the pioneers of intellectual life—strive to instruct and amuse us, and claim in return our sympathy and protection. Hence has arisen the law of copyright, in virtue of which the author of any work, however frivolous in its character, however immoral in its tendency, however subversive of order, and however hostile to religion, acquires a right of property which successive Acts of Parliament have enhanced in value, by lengthening its tenure and adding to its security. This just privilege, of which the humblest and the highest in the community avail themselves, is granted gratuitously by the State, and is enjoyed during the long period of forty-eight years, and by the youngest author during the whole of his life.

In the progress of civilisation, wants other than intellectual demand immediate gratification. The genius of invention in its youngest exercise, is summoned to feed and to clothe us, to conjure from the inner earth the elements of civilisation, to strengthen the human arm and aid the failing eye, to shield us from the elements, and to open to the missionary and the merchant the rough pathway of the ocean. In its manhood, it is summoned to more transcendental functions; to supply, for the higher civilisation, the luxuries and elegancies of life; to carry us swiftly and safely over earth and ocean; to navigate the fields of ether; to converse with the world, in accents of lightning, through the air and under the deep; to bring within our research the most distant star; and to reveal the minutest life which swarms beneath us and around us.

With such functions to discharge, and having discharged them nobly, the inventor might have looked for a generous patronage from the State, and for a monopoly as free and secure as the copyright of the author.

The right of property in inventions has been acknowledged by almost every community in the old and the new world,* and a patent law has been passed to define its character, to fix its limit, and to secure it against infringement.

In England, I grieve to say, her inventors are more cruelly taxed than in any other part of the world. Though her prosperity, more than that of any other nation, depends on the encouragement of the industrial arts, yet she levies from the poor inventor—nay, from her best benefactor, the enormous sum of L.175 for a patent-right of *fourteen* years. In France the same privilege, for *fifteen* years, is given for L.60, paid by instalments of L.4 for each year of its tenure; and in the United States a patent continues *seventeen* years, and costs only L.7, 6s. 10d. In Sweden and Norway a patent is given for *fifteen* years, for the mere expense of advertising the specification. In other countries the diversities in the expense and endurance of patent rights, measure the legislative wisdom which characterises the laws that pretend to encourage the useful arts; and show us how unblushingly the limited means of the poor inventor are transferred to the pockets of ignorant officials, and, in this country, accumulated in the coffers of an overflowing Exchequer.

The consequences of such ungenerous legislation it is not difficult to discover. The average number of patents granted annually in England is 2000, in France 4000, and in the United States 4000; and hence we are entitled to infer that upwards of 2000 patents are annually suppressed in England, and that many valuable inventions and processes in the arts are either not perfected by their authors, or employed in secret and for ever lost to society.*

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* Switzerland, China, and Japan have no patent law.

This is not the occasion to analyse the patent laws of England, and to criticise the principles which are supposed to regulate their enactments. It may be enough to have referred to the miserable tenure of *fourteen* years which they assign to the inventor; to the crushing tax of L.175 which they levy from him; to the illusory privilege which they give him; to the endless litigation into which they lead him; and to the bankruptcy and ruin in which he is so frequently involved. There are, doubtless, cases in which patent rights have led to fortune, but it is chiefly when the wealthy capitalist has come to the rescue of the humble inventor, or when the patent has been confirmed by the decision of a court of law.

The injustice of the patent law has been so fully admitted, that various acts of Parliament have been passed in favour of the patentee, adding slightly to the protection of his right, and reducing to the sum we have mentioned the expense of its attainment; but no addition has been made to the shortness of its tenure, and no increase of security against direct piracy, or partial infringement.

Whatever difficulty the statesman may experience in giving security to the rights of inventors, he can have none in giving them the same tenure as copyrights, and conferring them as gratuitously, or at no greater cost than is necessary to cover the expenses of the patent office.

Between the national claims of authors and inventors there can be no comparison. Value as you may, and value highly, the treasures of ancient and of modern thought, what are they when weighed against the inventions of art and science, predominating over our household arrangements, animating our cities with the sounds of industry, and covering with mechanical life the earth and the ocean? The eloquence of the orator, the lesson of the historian, the lay of the poet, are, as it were, but the fragrance of the plant whose fruit feeds us, and by whose leaves we are healed; or as the auroral tint which gives a temporary glory to a rising or a setting sun. But grant to the favoured genius of copyright its highest claims, and appreciate loyally its most fascinating stores, their value is shared, and largely shared, with that of the type, the paper, and the press, by which these stores have been multplied and preserved. The relative value of books and inventions may be presented under another phase. Withdraw from circulation the secular productions of the press that are hoarded in all the libraries of the world, and society will hardly suffer from the change. Withdraw the gifts with which art and science have enriched us—the substantial realities through which we live, and move, and enjoy our being—and society collapses into barbarism.

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* On this subject the Commissioners state, in their recent Report, that "They have been pressed with the opinion, that the cost of obtaining letters-patent is still so high as to be an insuperable bar to the poor inventor, in obtaining the protection to which he is fairly entitled."—*Report*, p. v. Lond 1865.

Under the influence of views like these, the friends of inventors have continued to watch over their interests, and to prosecute improvements on the Patent Laws. In this cause some of the leading members of the British Association, the Inventors' Institute, and the Social Science Congress, have been specially active, and through their exertions the subject was brought before the House of Commons in the last session of Parliament. In the discussions which took place in the House and in the Commission, the most startling opinions were advanced, and by some persons received with favour. The entire abolition of Patent Rights was gravely proposed, and the Report of the Commission was not submitted to the consideration of Parliament, on the ground that that fundamental question should be previously decided.

Had this proposal to rob the citizen of the most sacred of his rights been accompanied with any suggestion that Government should give equitable rewards for successful inventions, even patentees might have welcomed the change; but no such suggestions have been made, and, judging from the past history of British science and art, we cannot indulge the hope of any such act of national liberality. It is under despotic governments alone that national benefactors are rewarded and honoured. Where mammon is in the ascendant, and the demigods of trade and commerce influence legislation, intellectual eminence must look to other lands for its recognition and its patronage. The present raid against the patent laws is the direct and acknowledged result of the ungenerous influence of trade. The shortness of the tenure of patent rights, and the heavy tax levied from inventors, are expressly maintained, in order to diminish the number of patents; and the avowed reason for thus diminishing them is, that from their number and frivolity they interfere with the operations of tradesmen and manufacturers, by exposing them to actions for infringement.*

That there are many patents not remunerating, and not immediately beneficial, is painfully true, when we consider how much they have cost the sanguine inventor. That there are any patents really frivolous or useless, in the true sense of these terms, can be maintained only by ignorant or interested parties. There is no patent that does not contain a proposal to do something that is new, or to make some improvement upon what is old; and there are many examples of apparently useless patents containing the germs of future and valuable inventions. There are cases even in which the invention stigmatised as useless has proved to be an essential element in a future patent, where the new patentee has piratically used it, and dared to complain that he has been prosecuted for infringement. But there is a still more intelligible reason why no patent can be called useless. In bringing it into the market, workmen are employed, and materials purchased; and even if the process, instrument, or machine thus offered to the public has no sale and no useful application, the hapless patentee has given liberal fees to several functionaries of the State, and contributed nobly to the Patent Fund.

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* On this subject the commissioners make the following statement :—

"The evil arising from the multiplicity of monoplies *is alleged* to be of a twofold nature. In the first place, that of the existence of a number of patents for *alleged inventions* of a *trivial character;* in the second place, that of the granting of patents for inventions which are *either old* or *practically useless,* and are *employed by the patentees* only to *embarrass rival manufacturers.*"—*Report,* p. v. London, 1865.

These *allegations* submitted to the commissioners are not supported by specific facts, and are the mere opinions of interested parties. Before giving effect to such allegations, we may demand the following information :—

1*st.* A list of *alleged inventions* of a *trivial character.*

2*d.* A list of *old* patents that have embarrassed rival manufacturers.

3*d.* A list of *practically useless* patents that have embarrassed rival manufacturers.

4*th.* A list of the embarrassments occasioned to *rival* manufacturers by old, trivial, and useless patents; and,

5*th.* A list of actions for the infringement of patents, with the grounds upon which their validity was challenged.

That any patent is frivolous and injurious, in the sense of interfering with the functions of honest traders, is simply untrue. If an invention which has been patented at the cost of L.175, and produced nothing in return, is a necessary part of an important invention subsequently patented, it is a positive proof that patents apparently frivolous may be truly valuable. The first invention is, therefore, neither an obstacle to improvements, nor a ground for litigation. It has, on the contrary, led to a greater invention; and whether the second patentee has used it ignorantly, or advisedly, he ought to pay for the use of it, instead of pleading in a court of law, as he generally and dishonestly does, that the original specification is defective.

But even if the cases of interfering patents were more numerous than they are, and more fertile in litigation, it is the lawgiver, and not the inventor that is to blame. If Parliament, in its wisdom, cannot reconcile the interests of patentees and honest tradesmen but by robbing the former, they overlook the fundamental law in social economy, that no great improvement can be made in the arts of life, and no true reform in our institutions, without interfering with a variety of interests.

To abolish intellectual rights inherent in man, and long recognised and enjoyed, and this, too, on the single ground of public convenience, would be a retrograde step in legislation, of which history affords no example. As well might the surgeon propose to heal a rheumatic limb by amputation, or the philanthropist reform a criminal by his execution.

In proposing to abolish patent rights, its promoters seem to have wholly overlooked the international interests that are at stake. If we have no patent law, we deprive every foreigner of his existing right to a British patent. Foreign governments may therefore adopt a policy of retaliation, and refuse to our countrymen the patent rights which they now so freely enjoy; or, what is more probable, they may hold out additional privileges to our ingenious artisans, and thus obtain the first fruits of their skill. Inventors will follow their inventions, and in the exodus to foreign countries,—to the United States, especially, with its cheap and judicious patent laws, we shall lose, more rapidly than we have yet done, the most ingenious of our inventors, and the most useful of our citizens.

A policy like this, so Bœotian in its character, and so injurious in its results, is as politically unsafe as it is socially unwise, and personally unjust. Rights that have been firmly established and long enjoyed are not readily abandoned. Illiberal and oppressive as the patent laws are, they are still the *Magna Charta* of the commonwealth of inventors, and in an age tending to democracy they will not be surrendered without a struggle. Rights hitherto unquestioned, and not more sacred, may be exposed to the same scrutiny, and social interests endangered which all classes have been accustomed to respect and defend.

If these views of patent rights be just, and if, as moveable property, they are as sacred as copyrights, there can be no just reason why they should not be granted equally cheap, given to every applicant, and enjoyed during at least the life of the patentee. When a philosopher or an artisan offers an invention to the State, and receives an exclusive privilege in exchange, we might expect some equality between the gift and its reward. In perfecting his invention the inventor has already spent much of his time, and in many cases exhausted his means. When a suppliant at the Patent Office a heavy payment is demanded, and he purchases a privilege which may ruin him. The theory of such a tax it would be difficult to discover. Its avowed object is to diminish the number of patents for the benefit of non-inventors; but the object which it really accomplishes is to paralyse inventions; to cause valuable processes to be wrought in secret, and in many cases to be lost; to give fees to clerks and officers of State, and to create a fund, the purpose of which has not yet been revealed. A tax sufficient to defray the expenses of a patent office* might be justly exacted, but to demand a sum twenty-fold that amount is a freak of finance, alien both to reason and justice. Will it be believed in an enlightened age, that the sum paid by inventors to the State during nine years and a-half, from October 1852 to December 1861, was L.772,778, which, at the same rate, will be L.1,001,764 at the end of the present year?

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* In the Report of the recent Commission, it is stated that the Commissioners "find a very general expression of opinion that the price to be paid by inventors in the aggregate, should not be more than sufficient to provide for the expenses of the Patent Office Library and Museum."—*Report*, p. x. Lond. 1865.

Of the sum of L.772,778 received in 1861, L.502,000 has been expended, viz., L.96,000 in fees to law officers and their clerks, who do nothing for the inventor, and L.406,000 for the expenses of the Patent Office.

After all this expenditure, the enormous sum of nearly a quarter of a million of money, wrenched from the inventive genius of England, slumbers, unapplied, in the Exchequer, while our schools and universities are left to starve, and the interests of science and art consigned to the munificence of our scientific institutions.

In discussing the policy of untaxing, extending, and securing patent rights, we may view them in relation to the doctrine of free trade, now developing itself in the legislation of every civilised community. In the present state of the law, patent rights may be said to be imported and exported as freely as the instruments and machines in which they are embodied; but in so far as they are more taxed in one country than another, the trade in their products and in their privileges cannot be considered free. A discovery in science, and a process or invention in art, are gifts offered to the families of mankind wherever they are made, and whatever be their character. To fetter their development in one country while they are fostered in another, is an act of international injustice, which free trade disclaims. To tax them anywhere, under any circumstances, and under any pretence, is a blot upon political wisdom, an act of cruelty to genius, and a wrong inflicted upon society at large.

In tracing the rise and progress of those great inventions and discoveries which have added to our physical enjoyments and consolidated our power over the material world, we cannot fail to recognise the grand object which, in the arrangements of Providence, they are meant to accomplish. Whatever man is fitted to understand he is destined to know. Whatever has been created for his use he is destined to enjoy. We have yet much to learn of the sidereal universe of which we form a part; of the system of planets to which our own belongs; of the physical history and construction of our terrestrial home; of the organic and inorganic substances which compose it; of the precious materials stored up for civilisation; and of those noble forms of life and beauty which everywhere appeal to the affections and intelligence of man.

But while we have thus much to learn we have also much to do, and whatever we have power to do must eventually be done. The great inventions which, in living memories, have so mysteriously altered the social condition of our race, measure to us, however feebly, what art and science have still to accomplish. Our gigantic steam-vessels—our telegraphs, aerial and submarine—our railways—our light-houses, are still in their infancy. We have yet to pass through the sea with a surer compass, a sharper prow, and a stronger impulse. We have yet to speak more articulately through the air and beneath the ocean. We have yet to guard our coasts with brighter beacons and safer lifeboats; and our railways have yet to convey us more swiftly and safely to our home. But, what is more important still, we have yet to discover and combat those subtle poisons which are everywhere assailing the seat of life, and hurrying thousands of their victims to the grave.

In the completion of these great inventions and discoveries, we shall then learn, what statesmen have been unable or unwilling to learn, that art and science are the means by which the blessings of religion and civilisation are to be sent to the distant isles of the sea,—the several families of the earth united in one, and the reign of peace and righteousness established on the earth.

But while art and science are thus adding to our social blessings, and are pre-eminently the instruments of peace, they have in our day been busily and successfully employed in forging the weapons of violence and destruction. Nor is this a retrograde step in civilisation. By increasing the dangers, we diminish the chances, of war. In perfecting the machinery of Death, we eventually add security to Life. War may become so disastrous in its consequences, so indiscriminate in its slaughter, and so appalling in its carnage, that it will cease to be the arena of the heroic virtues; and this bloody scourge of humanity—the master crime of nations—will be crushed by the genius of art, and perish by the weapons itself has used.

In calling your attention to the present state of our Society, I regret to say that during the year which is about to close, our losses have been unusually severe, not only when reckoned numerically, but when measured by the talent and reputation of the colleagues we have lost.

Of our foreign Honorary Fellows we have lost two, Frederick George William Struve of Pulkowa, and Professor Encke of Berlin. Of our Honorary Home Fellows we have lost three—Sir John Richardson, Sir William Jackson Hooker, and Sir William Rowan Hamilton. Of our Ordinary Fellows we have lost seven:—Mr James Skene of Rubislaw; Professor Aytoun; Sir John Maxwell of Pollock, Bart.; Sir William A. Maxwell of Calderwood, Bart.; Dr Maclagan; Sheriff Gordon; and Dr Thomas Herbert Barker, Bedford. Two Fellows of the Society have resigned—Mr G. R. Maitland, and the Rev. Dr Nisbet. The names of two Fellows have been cancelled—Mr A. Mackenzie Edwards, and Mr Alfred Wanklyn. Two of the Fellows in our last list should have been transferred to the list of British Honorary Fellows—Dr Thomas Graham, Master of the Mint; and Sir John F. W. Herschel.

The following seven new Fellows have been elected:—Messrs Alfred R. Catton, Charles Jenner, Charles Lawson, junr., Dr John Moir, James Powrie, Rev. Francis Redford, and James Stevenson.

Upon our roll for 1864 we had Ordinary Fellows, .	279
Of these 7 have died, 2 have resigned, 2 have been cancelled, and 2 have been placed on the honorary list, .	13
Leaving	266
New Ordinary Fellows elected, ...	7
Total Ordinary Fellows on our list, ...	273

In proceeding to give a brief, but necessarily imperfect account of the colleagues we have lost, I must plead the difficulty of obtaining the requisite information so soon after their decease. On the present occasion, the duty is one of delicacy also, as I have been in personal communication with all of them but one, and with some in relations of a warmer kind. It is likewise one of some solemnity when discharged by one who, with a single exception, is senior to them all.

Frederick George William Struve, a distinguished astronomer, was born at Altona, on the 15th April 1793, and was the fourth son of Dr Jacob Struve, Director of the Gymnasium in that city. At the University of Dorpat, which he entered in 1808, and where his elder brother was classical lecturer, he took the degree of Doctor of Philosophy in 1813, and in the following year he was appointed Assistant at the Observatory, and Extraordinary Professor of Astronomy. In 1820, he was chosen Director of the Observatory, an office which he held till 1839, when he was called to the direction of the great observatory which the Emperor of Russia had established at Pulkowa, and furnished with the finest instruments.

Between 1816 and 1819, he executed the trigonometrical survey of Livonia. Between 1822 and 1827, he measured a part of the meridian in the Baltic provinces; and in 1831 he published an account of his operations. In 1828 he connected this survey with that of General Tenner; and in 1851 he completed the measure of the Russo-Scandinavian arc of the meridian between Ismael, at the mouth of the Danube, in 45° 20′ and Fuglenaes in 70° 40′ of north latitude,—an arc of 25° 20′, the largest that ever has been measured.

Among the other scientific expeditions undertaken by M. Struve, was the levelling of the country between the Black Sea and the Caspian Sea, the determination of the geographical position of several points in Siberia, in the Trans-Caucasian provinces and in Asiatic Turkey, and the observation of the great eclipses of 1842 and 1851. The results of these different expeditions have been published in the Memoirs of the Academy of Sciences of St Petersburg.

During the fifty years spent by M. Struve in the observatories of Dorpat and Pulkowa, he made many valuable observations on double and multiple stars; on the parallax of the stars, on their distribution in space; on the Milky Way; and on the motion of the solar system. His observations at Dorpat between 1837 and 1839 have been published in eight volumes. Those on Double Stars are contained in treatises published in 1820, 1827, 1830, 1837, and 1852; and those on the Parallax of the Fixed Stars, on the Milky Way, and on the Motion of the Solar System in Space, were published in 1847, in a very interesting volume, entitled "Etudes d'Astronomie Stellaire." Adopting 0″·209 as the parallax of stars of the first magnitude, he found that the annual velocity of the solar system round a point in the constellation Hercules is 33 millions of geographical miles, and that we may wager 400,000 to 1 that such a motion exists.

Frederick Struve was an ordinary Counsellor of State, a Commander of the Legion of Honour, and a Corresponding Member of the Imperial Institute of France. He died at St Petersburg, after a short illness, on the 23d November 1864, in the 72d year of his age, and was succeeded in the Direction of the Observatory of Pulkowa by his distinguished son, Otto William Struve, well known to the scientific world by his writings and his astronomical labours.

John Francis Encke, a distinguished astronomer, was born at Hamburg on the 23d September 1791. His father, who was minister of the church of St James', in that city, sent him to the University of Gottingen, where he studied under the celebrated Gauss, who was then Professor of Mathematics, and Director of the Observatory. In 1813 he was enrolled for active service in the military force raised by the Hanseatic towns, and afterwards rose to the rank of lieutenant of artillery in the Prussian service. In this capacity his acquirements became known to Baron Lindenau, the Director of the Observatory of Seeberg, near Gotha. Having become Minister of State in 1817, the Baron gave young Encke the entire charge of the Observatory, which he conducted so ably that he was made Joint-Director in 1829. Soon after this he was called to Berlin, where he was appointed Director of the Royal Observatory, and became Secretary to the Academy of Sciences.

During his occupation of these two observatories Encke made many valuable contributions to astronomy. Among the most important were his determination of the orbit of the famous comet of 1680, of the distance of the earth from the sun, and of the orbit of the comet discovered by Pons in 1818; for the first of which he obtained the prize of Cotta, adjudged to him by Gauss and Olbers. His solution of the problem of the Earth's Distance from the Sun, by the aid of the Transits of Venus in 1761 and 1769, was published in two memoirs, entitled *La Distance du Soleil.* In several papers in the Memoirs of the Academy of Berlin, between 1829 and 1851, he demonstrated the periodicity of Pons' comet, which he proved to be identical with the comets of 1786, 1795, and

1805. This interesting body, now known as Encke's Comet, moves in an elliptical orbit within that of Jupiter, and completes its revolution in three years and four mouths. Having found that from 1786 to 1795 the time of its revolution had diminished from 1208·11 days to 1207·88, and between 1795 and 1805 from 1207·88 to 1207·42 days, he concluded that the diminution was produced by the action of Jupiter; but upon using a more correct value of the mass of that planet, he found that the difference between the observed and computed places of the comet could be accounted for only on the hypothesis of a resisting medium—a doctrine which, in its astronomical relations, must remain in abeyance, till it is exhibited in the motions of other celestial bodies.

Upon his removal to Berlin, Encke became editor of the *Astronomisches Jahrbuch*, which contains many of his papers on physical astronomy. He visited Scotland in 1839, and took an active part in the proceedings of the British Association which met at Glasgow. He was a member of many foreign academies, and a Corresponding Member of the Imperial Institute of France. He died at Berlin in 1865, in the seventy-fifth year of his age.

Sir **John Richardson**, the distinguished Arctic traveller and navigator, was born at Dumfries in 1787, and was educated at the grammar school of that town. He entered the University of Edinburgh in 1801, with the view of following the medical profession. After obtaining the diploma of the Royal College of Surgeons, he was appointed assistant-surgeon to the Nymphe, one of Sir Richard Keats' squadron, which accompanied Lord Gambier to the bombardment of Copenhagen. In 1807 the Nymphe was employed in the blockade of the Tagus; and Mr Richardson was present, as a volunteer, in two unsuccessful attempts to cut out vessels anchored higher up the river. After serving in different ships in various parts of the world, he returned to Edinburgh to pursue his medical studies; and in 1817 he took the degree of doctor of medicine. In 1819 he was appointed surgeon and naturalist to the expedition under Lieutenant Franklin, which was sent to survey the northern coast of North America. He returned to England in 1822, and in 1824 he was appointed surgeon to the royal marines at Chatham. In the expedition under Captain Franklin, which was carried on in the years 1825–6–7, Dr Richardson surveyed with great ability the sea-coast between the Mackenzie and the Coppermine Rivers; and after his return, he resumed and continued his duties at Chatham till 1838, when he was promoted to the rank of physician to Haslar Hospital, and Inspector of Naval Hospitals and Fleets—a situation which gave him leisure to pursue the studies to which he had been so long devoted. His services, however, were too valuable to be dispensed with; and though now in the sixtieth year of his age, he set out with Dr Rae, in 1848, in search of Sir John Franklin and his party. After encountering perils both on land and sea, and surmounting difficulties of no ordinary kind, he returned to England in 1849, and continued for six years in the charge of Haslar Hospital. In 1855 he retired from the public service, to which he had devoted himself for nearly half a century, and settled at Lancrigg, in Westmoreland, where he died on the 5th January 1865, in the seventy-eighth year of his age.

Sir John received the honour of knighthood in 1846, and was afterwards made a Companion of the Bath. He was a Fellow of the Royal, Linnean, and Geological Societies, and a member of various philosophical societies, both in this country and the Continent.

Sir John is the author of the *Fauna Borealis Americana*, and of works on almost every branch of natural history, several of which appeared as appendices to the voyages of different Arctic navigators. He contributed several articles to the "British Encyclopædia," and was one of the editors of the "Museum of Natural History."

Sir **William Jackson Hooker**, a distinguished botanist, was born at Norwich on the 6th of July 1785, and received his early education at the High School of that city. His father, who was a man of literary tastes, possessed a collection of rare and curious plants; and it was no doubt from this circumstance that he was led to the early study of botany. Having inherited from his godfather, William Jackson, Esq., a considerable landed property, he resolved to devote himself to scientific pursuits; but in order to improve his lands, he spent some time in the study of agriculture at Starston in Norfolk.

Here, however, he devoted most of his time to the study of natural history, making a fine collection of the birds and insects of Norfolk. Having discovered a new and curious British moss, the *Buxbaumia aphylla*, he took it to Sir James Edward Smith, and was encouraged by that eminent botanist to pursue the study which he had so successfully begun. In 1806, when he came into possession of his fortune, he made extensive botanical tours in the remotest parts of Scotland in company with Dawson Turner, Esq., whose eldest daughter he married in 1815. By the advice of Sir Joseph Banks, with whom he became acquainted during his residence in London, he visited Iceland in 1809, and made large collections there in every department of natural history. The ship, however, in which he returned was burned at sea, and he himself miraculously escaped by the help of another vessel, with the loss of all his manuscripts, drawings, and specimens. His account of this journey, drawn up from memory, was published in 1811 under the title of "Recollections of Iceland," the first of a series of works which raised him to a high place in the scientific world.

In 1810–11 he made great preparations to accompany Sir Robert Brownrigg, who was going out as governor to Ceylon, but the sanguinary disturbances which took place in that island prevented him from visiting it.

In 1814 he made a botanical tour of nine months in France, Switzerland, and the North of Italy, and thus became acquainted with many of the most distinguished botanists in Europe. In 1812 he began his first botanical work, on the British Jungermanniæ, which was completed in 1816. This work was followed by his *Muscologia Britannica* and his *Musci Exotici*, the first of which was published in conjunction with Dr Taylor in 1817.

While engaged in these and other works, he found it necessary to look out for some permanent employment. He had sold his landed property in 1811, and vested the proceeds in different securities, which had so rapidly deteriorated, that in 1820, on the advice of Sir Joseph Banks, he accepted of the vacant Professorship of Botany in the University of Glasgow, which was then worth little more than L.100 a year, but which afterwards rose to upwards of L.800.

During the twenty years he resided in Glasgow he published his

Flora Scotica, which appeared in 1821; his *Flora Exotica,* in 1823–27; his *Icones Filicum,* in conjunction with Dr Greville; and in 1839 the first edition of his *British Flora,* in the 12th edition of which he was assisted by Professor Walker Arnott.

In 1836 he received the honour of knighthood, and through the influence of Earl Russell he was appointed, in 1841, Director of the Royal Gardens at Kew, a situation which he held during the rest of his life. In this favoured position he improved the arrangements of the Gardens, and prevailed upon Government to build a noble palm-house and extensive conservatories, and he founded a library and botanical museum, in which his noble herbarium, the largest in Britain, is deposited.

The works of Sir William Hooker, comprising upwards of fifty volumes of descriptive botany, illustrated chiefly by drawings from his own exquisite pencil, are too numerous to be mentioned in detail in a brief notice of his life.

Sir William was a Knight of the Hanoverian Order and a Chevalier of the Legion of Honour, and he received from Oxford the degree of D.C.L., and from Glasgow that of LL.D. He was a Fellow of the Royal, Linnean, Antiquarian, and other English Societies, and a Corresponding Member of the Imperial Institute of France, and of all the principal Academies in Europe and America.

He died at Kew on the 12th of August 1865, in the 80th year of his age, and is succeeded in the direction of the Royal Gardens by his distinguished son, Dr Joseph Dalton Hooker.

Our list of British Honorary Fellows has sustained an irreparable loss by the recent death of Sir WILLIAM ROWAN HAMILTON, one of the greatest mathematicians that have ever lived.

At an early age he displayed uncommon talents, especially in the study of languages. He is said to have acquired nearly a dozen different languages when only thirteen years old. In his fifteenth year he had already mastered all the branches of mathematics usually taught in a university; and in his twenty-second year, while but an undergraduate of Trinity College, Dublin, was appointed Andrews' Professor of Astronomy, and Astronomer-Royal for Ireland, as successor to Dr Brinkley, who had been one of the first to recognise his wonderful mathematical powers, and to guide his early investigations.

These early investigations, which had reference chiefly to Geometrical Optics, were gradually developed into an elaborate "Theory of Systems of Rays," which was communicated to the Royal Irish Academy in 1828. In the third supplement to this essay, he predicted from theory the existence of the two species of Conical Refraction, the experimental verification of which has given so much additional probability to the hypothesis of luminiferous undulations.

His next great papers were entitled "On a General Method in Dynamics," and appeared in the Philosophical Transactions in 1833–34. In these he developed the principle of Varying Action, the discovery of which constitutes one of the most important steps which dynamical science has yet made. In these investigations, both optical and dynamical, the novel and remarkable feature is the discovery of the existence of a single function (adapted to each particular problem), from which, if known, the complete solution of the problem is to be found by differentiation alone. These papers soon gave him a European fame, and procured for him the honorary diploma of all the most important scientific societies abroad, as well as at home. Though much has been done, especially by Jacobi, in extension of Hamilton's results, it has been almost entirely confined to their analytical aspect; the physical discoveries which must abundantly flow from them have, as yet, been barely sought for.

But perhaps Hamilton was most widely known by his splendid invention of "Quaternions." A profound general principle in optics or dynamics is heard of only by the few who can understand it; but a new mathematical method is, at least in its elements, accessible to all. Little has yet been done to disseminate elementary knowledge of this important Calculus. Hamilton's "Lectures on Quaternions" (1853) is adapted only to a high class of readers; but it is to be hoped that his posthumous work, to which he devoted the last six years of his life, and which (under the title of "Elements of Quaternions") is announced for speedy publication, will put within the reach of the intelligent beginner a branch of mathematics which for simplicity of conception, symmetry, variety of expression, and almost irresistible power, may well challenge comparison with any yet devised.

Hamilton's other numerous publications, chiefly in scientific journals, such as the "Transactions of the Royal Irish Academy," the "Philosophical Magazine," &c., are devoted to the most varied subjects. "Algebra as the Science of Pure Time," "Abel's argument as to the impossibility of solving the general equation of the fifth degree," "Definite Integrals," "Fluctuating Functions," "Icosian Calculus," &c., may be taken as examples. But, besides all this, he is understood to have left an immense store of manuscript investigations on subjects of the greatest importance, from which, it is to be hoped, copious selections will be published. Hamilton was scrupulous, almost to excess, as to the exactness and symmetry of everything he published; and it may be that, among the investigations which he did not consider properly polished for the press, there are gems of even greater value than those which have seen the light.

In a life of but sixty years such a mass of original work has not often been accomplished; but when we consider that Hamilton retained to the last his love for languages (especially Persian), that he was no mean poet, that he was one of the most copious of correspondents, and that he willingly entered into the minutest details when applied to for explanations on subjects connected with his writings, we wonder how he found time for a mere fraction of what he has done.

Sir John Herschel once wrote thus:—"Here, whole branches of continental discovery are unstudied, and, indeed, almost unknown even by name. It is vain to conceal the melancholy truth. We are fast dropping behind. In mathematics we have long since drawn the rein and given over a hopeless race, &c." Hamilton, while second to none, was one of the earliest of that brilliant array of mathematicians who, since Herschel wrote, have removed this stigma, and well-nigh reversed the terms of his statement. Another was the late Professor Boole, who, though not a Fellow of this Society, claims notice in this address as having received our highest honour, the Keith Medal. Their death has made a gap in the ranks of British science which will not soon be filled; and our sorrow is but increased by the recollection that they have been removed in the full vigour of their intellect, and when their passion for work was, if possible, stronger than ever.

Dr **David Maclagan** was born in Edinburgh in February 1785. After receiving his classical education at the High School, he entered the University as a student of medicine, and was apprenticed to Mr Andrew Wood, one of the principal surgeons in the city. In 1804 he took his surgeon's diploma, and in 1805 his degree of M.D., and he prepared himself for the medical service of the army by studying at St George's Hospital, and becoming in 1807 a Member of the Royal College of Surgeons in England. Attached to the 91st regiment, he accompanied it to Walcheren, where he had the good fortune to escape the epidemic which decimated the flower of the British army. In 1811, after his return to England, he was under orders for Canada, when he received the appointment of staff-surgeon to the 9th Portuguese brigade, a part of the 4th division, which, under the Duke of Wellington, was investing the fortress of Badajos. He accordingly sailed for Lisbon in November 1811, and was present at the storming of Badajos, and at the subsequent battles of Salamanca, Vittoria, the Pyrenees, the Nivelle, and the Nive, receiving for these services the Peninsular medal, with six clasps. The professional skill which he exhibited on these occasions, and his active zeal for the recovery of the wounded, were frequently acknowledged by his military superiors, and led to his appointment as physician to the forces.

In 1816 Dr Maclagan quitted the army on half-pay; and having been admitted a Fellow of the Royal College of Surgeons, he settled in his native city, when his professional skill soon obtained for him an extensive practice. In 1826 he was elected President of the Royal College of Surgeons, and of the Royal College of Physicians in 1856. He presided also over the Medico-Chirurgical Society, and took an active and intelligent part in all our literary, scientific, and philanthropic institutions. In the cause of medical missions he took an early and zealous part; and the friends of every religious movement could always count upon his active and generous support.

To his professional accomplishments, Dr Maclagan added a taste for the fine arts, and he was intimately acquainted with the eminent artists who in his time adorned our metropolis.

Amid the distractions of his professional life, which lasted more than half a century, he found leisure to study the great social questions of the day, and was an ardent promoter of Parliamentary and burgh reform, free trade, Catholic emancipation, the education of the people, and the abolition of slavery. But while he thus took a zealous part in every question, and in every institution of secular interest, he had ever in his view the higher destinies of man. He was an exemplary member of the Presbyterian Church, and a true believer in those great truths which the wisdom of this world is unable to comprehend. Without any marked disease, but weakened gradually with age, this truly Christian physician and philanthropist expired on the 6th June 1865, in the midst of his family, lamented by a widow and seven sons, some of whom have obtained distinction in the service of their country.

Sir JOHN MAXWELL of Pollock succeeded his father as ninth baronet in 1844, and belonged to the twenty-ninth generation of his family. He was born in 1791, and received his early education, partly in Scotland, under the Rev. Dr MacLetchie of Mearns, and partly in England, at Market-Raisin, and subsequently at Westminster School. In 1809 he entered Christ Church, Oxford, as a gentleman commoner, and graduated in that University. In 1812 he attended several classes in the University of Edinburgh; and in the following year, at the age of twenty-two, he was appointed lieutenant-colonel of the Renfrew militia—an office which he very soon resigned, in consequence of the Government refusing to send relief to the starving operatives in Paisley. In 1813, 1814, and 1815, he made the tour of Europe, visiting part of Africa and Asia, accompanied by Mr John Bramsen, an ex-officer of the Prussian service, and afterwards Professor of German in the University of Oxford. A journal of his travels is preserved at Pollock; but a fuller account of them was published in 1818 by Professor Bramsen.

In 1818, Mr Maxwell was elected M.P. for the county of Renfrew, and represented that county in three successive Parliaments. In 1831 he contested the county of Lanark with the brother of Lord Douglas; but though defeated on that occasion, he was elected for that county in 1832, after the passing of the Reform Bill, and again in 1835. As a Member of Parliament, he took an active part in many of the leading measures of the day; and on several occasions when he spoke in the House of Commons, he was listened to with attention and respect.

In 1859, when the Prince of Wales, on the 15th August, visited for the first time his ancient barony of Renfrew—the cradle of his Stuart ancestors in Scotland—he was hospitably received at Pollock House.

Sir John Maxwell was liberal in his politics, and published several pamphlets on Parliamentary reform, and the other great questions which then agitated the country.

In 1839, he married Lady Matilda Bruce, second daughter of Thomas Earl of Elgin and Kincardine. She died on the 31st August 1857, without issue. Sir John died on the 6th of June 1865, in the seventy-fifth year of his age, and was succeeded in his estates by his nephew, William Stirling, Esq. of Keir.

Sir **WILLIAM ALEXANDER MAXWELL** of Calderwood, descended from the oldest branch of the Maxwells of Pollock, and the seventh baronet, was born on the 30th April 1793. He entered the army at an early age, and held a commission in the 1st or Royal Dragoon Guards. Upon succeeding to his father in 1837, he retired from the service with the rank of colonel. In 1847 he married the fifth daughter of Walter Logan, Esq. of Fingalton. He died on the 4th of April 1865, in the seventy-fifth year of his age, and was succeeded by his brother, Mr Hugh Bates Maxwell, who had been called to the Scotch bar in 1818.

JAMES SKENE of Rubislaw, was born on the 7th March 1775. His father died in the following year, leaving a widow and a family of seven children. In 1783, Mrs Skene removed to Edinburgh for their education, and James, who was then the second son and youngest child, was placed at the High School; and was the last survivor of a host of distinguished men who were his class-fellows.

In 1791, after he had left the High School, he succeeded to the family-estate of Rubislaw, by the death of his elder brother; and at the age of twenty-one, he was sent to Germany to complete his studies. After acquiring a knowledge of the French and German languages he returned to Edinburgh, and was admitted to the Scotch bar in 1797. Here he formed an acquaintance with Sir Walter

Scott, which ripened into a close and life-long friendship. Mr Skene had early shown a love of art, and a singular talent for drawing, to which Sir Walter alludes in the introduction to the 4th canto of Marmion, which is dedicated to Mr Skene.

> "As thou with pencil, I with pen,
> The features traced of hill and glen."

In 1797 Mr Skene was appointed cornet of the Edinburgh Light Horse, one of the earliest regiments of volunteers, which was organised mainly by the efforts of Sir Walter Scott. After walking the Parliament House for a few years, Mr Skene revisited the continent in 1802, and travelled over the greater part of Europe during the next few years. In this journey he became acquainted with Mr Greenough, President of the Geological Society of London, and travelled for some time with that distinguished geologist. He thus acquired a taste for geology, and was afterwards elected a member of the Geological Society.

In 1806 Mr Skene married Jane, daughter of Sir William Forbes of Pitsligo, Bart., and settled on a small property he possessed in Kincardineshire, where he spent the next eight years of his life.

In 1816 Mr Skene returned to Edinburgh, for the education of his children, when he joined the different literary and scientific societies, which at that time were not in a very flourishing state. He became a member of the Royal Society in 1817, and as Curator of their Library and Museum, an office which he held for many years, he did eminent service to that important department of the Society. He was also a member of the Antiquarian Society, and took an active part in its reform and restoration.

During his residence in Edinburgh Mr Skene explored and sketched the various buildings in the Old Town that were remarkable for their antiquity or historical interest, and he has left a valuable collection of these sketches, which we trust may be given to the public.

Mr Skene held for many years the office of Secretary to the Board of Trustees and Manufactures, and in this capacity he did much for the promotion of the fine arts in Scotland.

In 1838, when the health of some of his family required a warmer climate, he went to Greece, and settled in the vicinity of Athens.

In an elegant villa, built by himself, he spent eight years; and he has left behind him a series of beautiful water-colour drawings, upwards of 500 in number, of the scenery and antiquities of that interesting country.

On his return to England in 1844, he took up his residence in Leamington. He afterwards went to Oxford, and resided in a curious old mansion, called Frewen Hall, where he enjoyed the best literary society in that seat of learning. After a residence there of nearly fifteen years, he died on the 27th of November 1864, in the 90th year of his age.

Mr Skene was a man of very elegant tastes and numerous accomplishments. He had a great general knowledge of science as well as of literature, and spoke with fluency French, German, aud Italian. He was, as Sir Walter Scott said, "the first amateur draughtsman in Scotland," and was the author of two volumes of Illustrations of the Waverley Novels. But though he used his pencil more than his pen, yet he made several contributions to the Transactions of the Societies to which he belonged, and was the author of the excellent article on painting in the Edinburgh Encyclopædia.

JOHN THOMSON GORDON was the only son of Dr John Gordon,—a distinguished teacher of anatomy in this city, and author of several valuable treatises on anatomy and physiology,—and of Miss Rutherfurd, sister of the late eminent lawyer and judge Lord Rutherfurd. He was born in Edinburgh, on the 19th March 1813; and, after gaining distinction as a classical scholar at the Edinburgh Academy and at this University, he prosecuted with great zeal and success the study of the modern languages at Aschaffenburg, in Bavaria. He was called to the bar in 1835, and was remarkable among his compeers for the extent of his scholarship, the richness of his fancy, and the natural eloquence of which he was possessed, and these, from the geniality of his nature, were always at the disposal of his friends and the public.

In 1837 Mr Gordon married the second daughter of Professor Wilson, and has left five sons and one daughter.

He was appointed Sheriff of Aberdeenshire in 1847, and of Mid-Lothian in 1848, an office which he held, and the duties of which he discharged with great ability, till his death, which took place suddenly, at Caen in Normandy, on 22d September 1865.

Thomas Herbert Barker, a distinguished member of the British Medical Association, was born in 1814. He received his professional education at Queen's College, Birmingham, and at University College, London. He was licensed by the Apothecary's Company in 1827, and became a member of the Royal College of Surgeons in 1842, and a Fellow of the same body in 1851. Although he obtained great distinction in the different departments of his profession, yet his reputation mainly rests upon his investigation of the cause of epidemic and endemic diseases.

In 1858, the Fothergill Gold Medal was awarded to him for his essay on Malaria and Miasmata, which was published in 1862, and in the course of last summer he received from the British Medical Association the Hastings Gold Medal for his essay on Deodorisation and Disinfection. Dr Barker is also the author of a valuable work on the "Hygienic Management of Infants and Children," and of various articles in the medical journals. He died at Bedford of a severe attack of typhoid fever on the 24th October 1865.

William Edmonstoune Aytoun was born in June 1813. His father, who was an eminent writer to the Signet, died when his son was comparatively young. After receiving his elementary education at the Edinburgh Academy, he went through the usual curriculum of study at the University of Edinburgh, which he was destined afterwards to adorn. At the end of his course he went to Germany, where he acquired that knowledge of its literature which is so conspicuous in his writings. On his return to Scotland he passed as a writer to the Signet, but disliking the profession, he was called to the Scottish Bar in 1840, and practised for some time in criminal cases on the western circuit. His time, however, was devoted principally to literature, and, with some exceptions, his earliest productions were contributed to Tait's Magazine, where, in conjunction with his friend Mr Theodore Martin, he began his celebrated Bon-Gualtier Ballads, which have gone through many editions. In 1832 Mr Aytoun published his first separate work entitled "Poland, Homer, and other Poems." In 1833 he made the first contributions

wood's Magazine, and from that time to his death they
ed to more than a hundred and twenty. In 1843 he contri-
that Journal the two beautiful poems entitled the "Burial
f Dundee," and "Charles Edward at Versailles," and in
s celebrated satire on railway speculation, entitled "How
up the Glenmutchkin." His "Life and Times of Richard
ppeared in 1840, and in 1849 his most popular work, "The
the Scottish Cavaliers," the most interesting of which,
urgh after Flodden," had appeared in Blackwood's Maga-
the preceding year.

45 he succeeded Professor Spalding as Professor of Rhetoric
glish Literature in the University. To the duties of this
devoted himself with great energy and success, raising his
m thirty to upwards of one hundred and fifty students.

849, Professor Aytoun married the youngest daughter of
or Wilson, in the society of whom ten years of domestic
ss passed rapidly away.

52 he was appointed Sheriff of Orkney and Shetland, spend-
hese islands several months in the year, and discharging the
f his office with much assiduity and success.

54 he published "Firmilian—a Spasmodic Tragedy;" in
Bothwell—a Poem;" in 1858, "the Ballads of Scotland;"
1861, a novel, entitled "Norman Sinclair." The last of
arate works was the "Nuptial Ode on the Marriage of
. the Prince of Wales."

863 Professor Aytoun married Miss Kinnear—a happy union
e was destined not long to enjoy. His health had, in the
g winter, begun to fail, and unfitness for intellectual pursuits
o indicate the commencement of some serious malady. In
inning of last June he went to Blackhills, near Elgin, in the
recovering his strength while enjoying the hill and field
f that delightful neighbourhood. This hope, however, was
us. Neither the salubrity of the climate, nor the bracing
of the fields, nor the skill of his physician, could arrest
gress of that fatal disease which was rapidly invading the
life. He sank gradually under its influence, and in the full
on of his faculties, and he died, as a Christian should die,
4th August 1865, in the 53d year of his age.

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nong the eminent men whose loss this Society and the Univer-
nave had recently to deplore, Professor Aytoun holds a distin-
ned place. As a poet of high talent and varied acquirements,
nguished alike by his genial humour, and by the force and
y of his satire, he will be long and warmly admired, but more
ly still by those who weep over the memories of that unfor-
te dynasty which he has so ably and loyally immortalised. As
le and assiduous judge, he will be long and kindly remem-
l by the islanders among whom he annually laboured; and as
fessor in the University which he adorned, his pupils will not
forget his earnest sympathy with their studies, nor his col-
ies his devotion to the interests of the University, and the
y hours which they spent in his society.

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